An Electrochemical Carbon Nanotube Filter for Water Treatment Applications

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Nanotechnology has the potential to solve many environmental issues including the development of new and more effective water treatment technologies. Carbon nanotubes (CNTs) have a number of unique physical chemical properties such as have high aspect ratios, high specific surface areas, mechanical strength, chemical stability, and are conducting or semiconducting. Thus, CNTs can be formed into mechanically-strong and electrically-conducting porous thin films or three-dimensional networks that have potential for many applications including water purification. Here, we design and modify a filtration device to allow for *in situ* electrochemistry using a perforated stainless steel cathode and an electrochemically-active multi-walled carbon nanotube (MWNT) microfilter anode; 40 to 100 μm in height and pore diameter of 50 to 130 nm. The electrochemical carbon nanotube filter performance towards the removal and oxidation of aqueous dyes, anions, and microorganisms is evaluated. Electrochemical filtration at 2 V resulted in >98% oxidation of influent dye and >6-log removal and/or inactivation of influent bacteria and virus. Environmental applications of the electrochemical CNT filter are discussed.